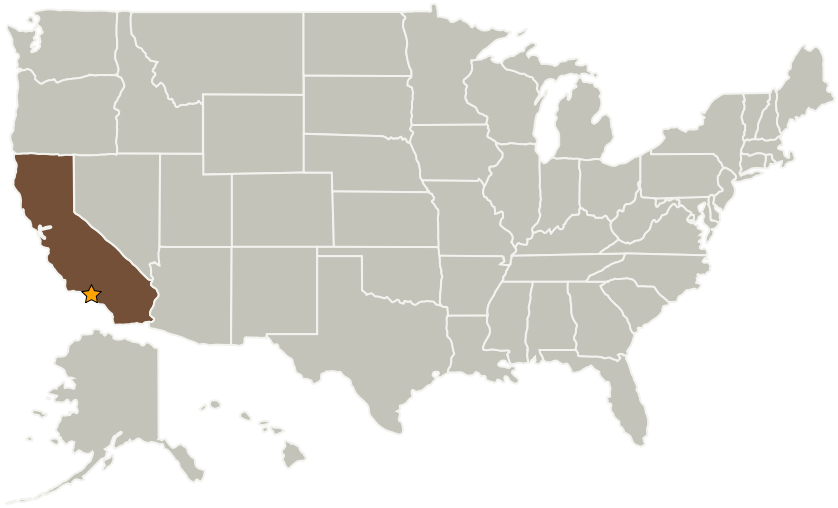
Rectified Continuous Flow Loop for Thermal Control of Large Deployable Structures and Distributed Loads, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

Future instruments and platforms for NASA's Earth Science Enterprises will require increasingly sophisticated thermal control technology, and cryogenic applications will become increasingly more common. For example, Fourier Transform Spectrometers capable of high-accuracy cloud-profile measurements will require cryogenically cooled optics and detectors. While a number of cryogenic refrigeration systems may be considered for such applications, none offers the same potential for low vibration, reliability, and efficiency as the pulse tube. Typically, regenerative coolers such as pulse tubes, many of which are currently under development, have small cold heads that must be conductively coupled to heat loads. However, conductively cooled loads are often linked to their respective cryogenic systems through massive structures that must simultaneously have high thermal conductivity and low electrical conductivity y a combination not simple or economical to achieve. This work proposes to develop an innovative, light-weight, continuous-flow cooling loop for cooling distributed loads such as those represented by large deployable structures, including optical mirrors, actively cooled sunshades, and on-focal-plane electronics. The basis of the loop is a rectifying interface that converts the oscillating flow of a regenerative cryocooler into a steady flow of cold gas that can readily be distributed over distances of several meters.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Atlas Scientific	Supporting Organization	Industry	San Jose, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

James Maddocks

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.1 Cryogenic Systems
    - TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors